ZOOGOER

NOVEMBER • DECEMBER 1992

Photograph by Michele Hallen, Watkins Glen, New York.

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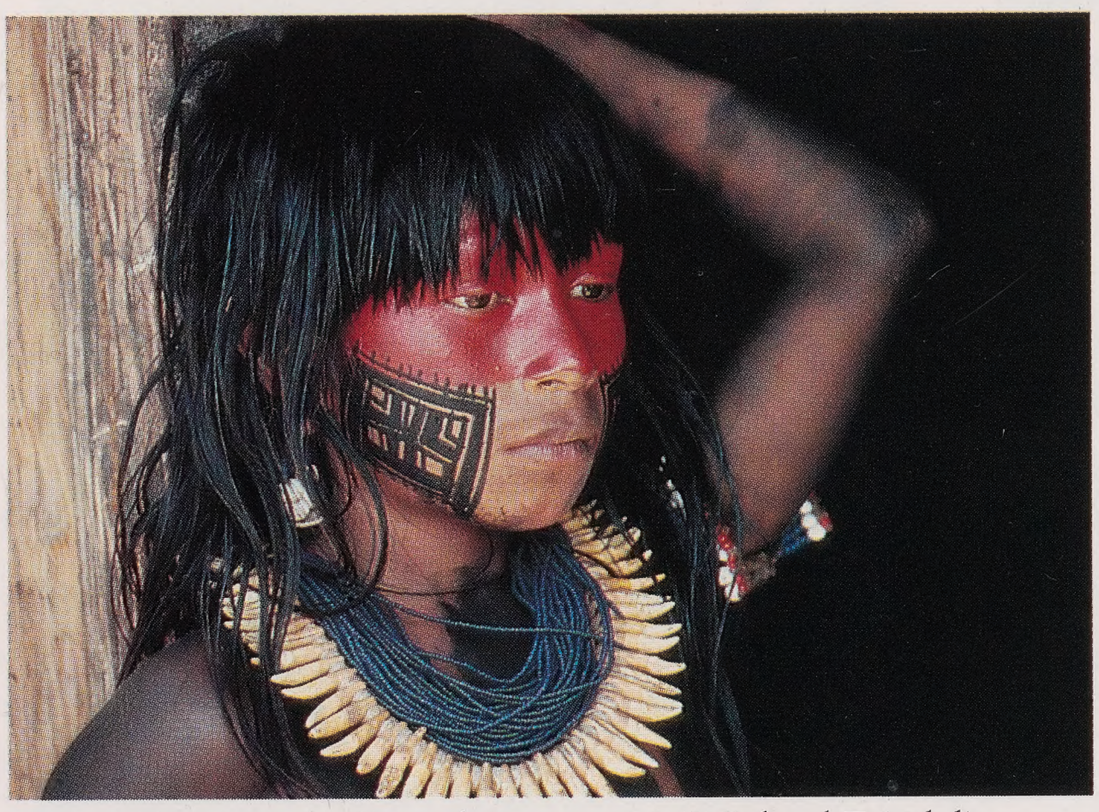

Young Caiapo warrior of Amazonia. (Michael Friedel)

FEATURES

DEPARTMENTS

Friends of the National Zoo

is a nonprofit organization of individuals, families, and organizations who are interested in helping to maintain the status of the National Zoological Park as one of the world's great zoos, to foster its use for education, research, and recreation, to increase and improve its facilities and collections, and to advance the welfare of its animals.

ZooGoer [ISSN 0163-416X] is published six times a year by Friends of the National Zoo to promote its aims and programs, and to provide information about FONZ activities to its members, volunteers, and others interested in the purposes of FONZ. The nonmember subscription rate is $12 a year. Third class mailing permit no. 6282.

The National Zoological Park is located in the 3000 block of Connecticut Avenue, N.W., Washington, D.C. 20008, 202-673-4717. Weather permitting, the Zoo is open every day except Christmas. Hours: From October 16 to April 14, grounds are open from 8:00 a.m. to 6:00 p.m.; buildings, 9:00 a.m. to 4:30 p.m. From April 15 to October 15, grounds are open from 8:00 a.m. to 8:00 p.m.; buildings, 8:00 a.m. to 6:00 p.m.
Director: Michael H. Robinson.

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Cover: Living in Amazonia, a Urueu-Wau-Wau child with a macaw, his tribal totem. *(Loren McIntyre)*

Amazonia

Amazonia is open! Seven years in the making, the *Amazonia* habitat exhibit is spectacular—a crowning achievement for all who have participated in its creation, and a remarkable resource for educating people about the vital importance of saving the world's rainforests.

The message is inherent in the sheer exuberance of the exhibit, which contains a living rainforest of 50-foot-tall trees festooned with fruits and flowers, tropical vines, spiky bromeliads, and exquisite orchids. Some 358 species of plants in all grow in the sunlight that filters through the domed skylight. Schools of Amazon River fish swim in a simulated river and in quiet pools; and insects, birds, reptiles, amphibians, and mammals occupy the forest from its floor to the canopy. No one who enters *Amazonia*, where even the temperature and humidity are tropical, will fail to come away with an appreciation for the amazing diversity of the Amazonian rainforest.

We at FONZ are proud to have contributed to the Zoo's efforts. FONZ supported *Amazonia* with ZooFari funds, which were used to acquire fish and plants for the exhibit as well as to create colorful banners for the exterior. FONZ also recruited and trained the volunteer interpreters who are helping visitors at the exhibit. And, to provide additional educational materials, FONZ has created a specialty shop within *Amazonia* that offers an extensive collection of books about the Amazon.

Plan to visit *Amazonia* soon and see for yourself this most exciting new exhibit.

Sincerely,

Clinton A. Fields
Executive Director

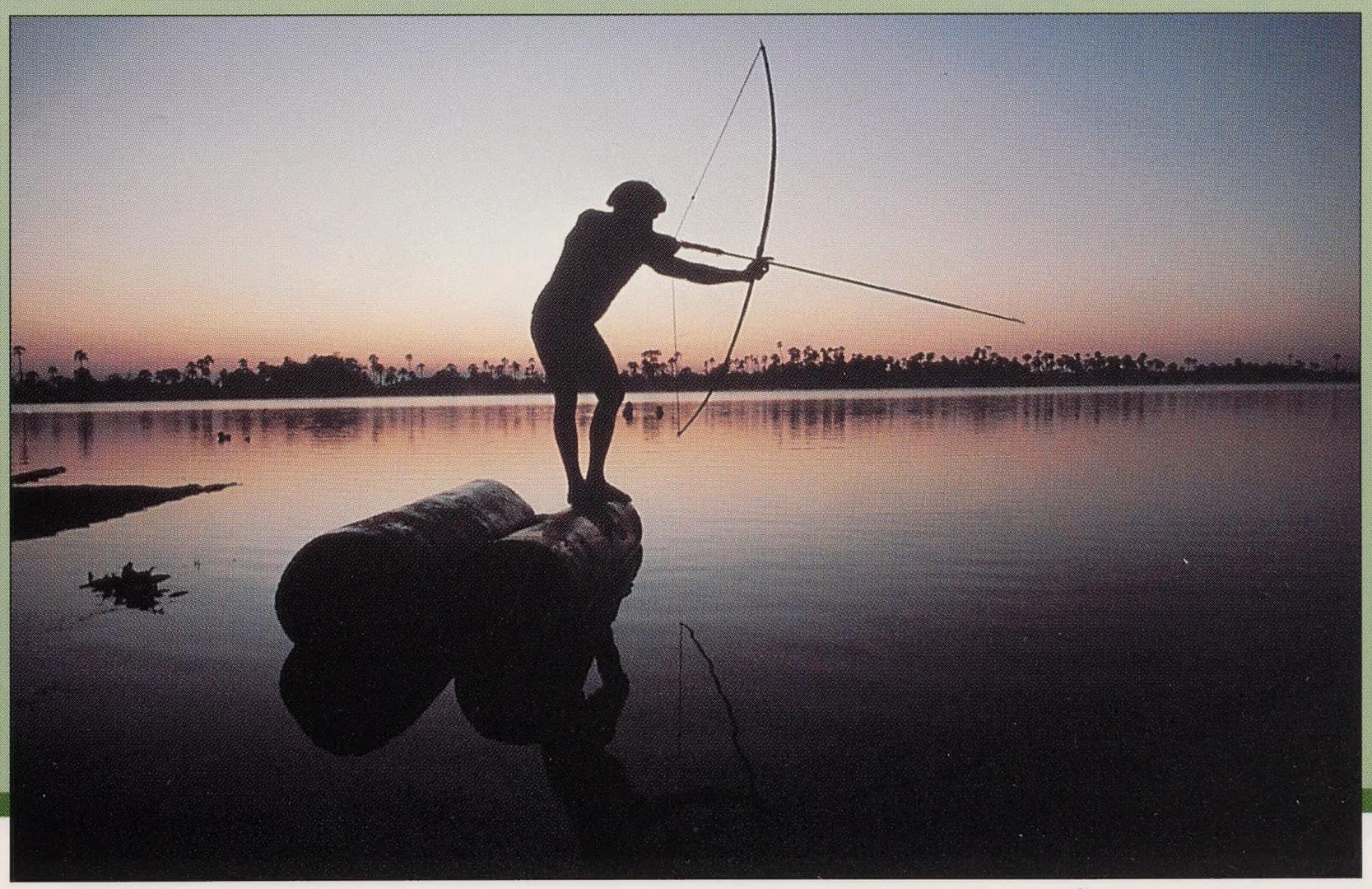
GLIMPSES OF AMAZONIA

Susan Lumpkin

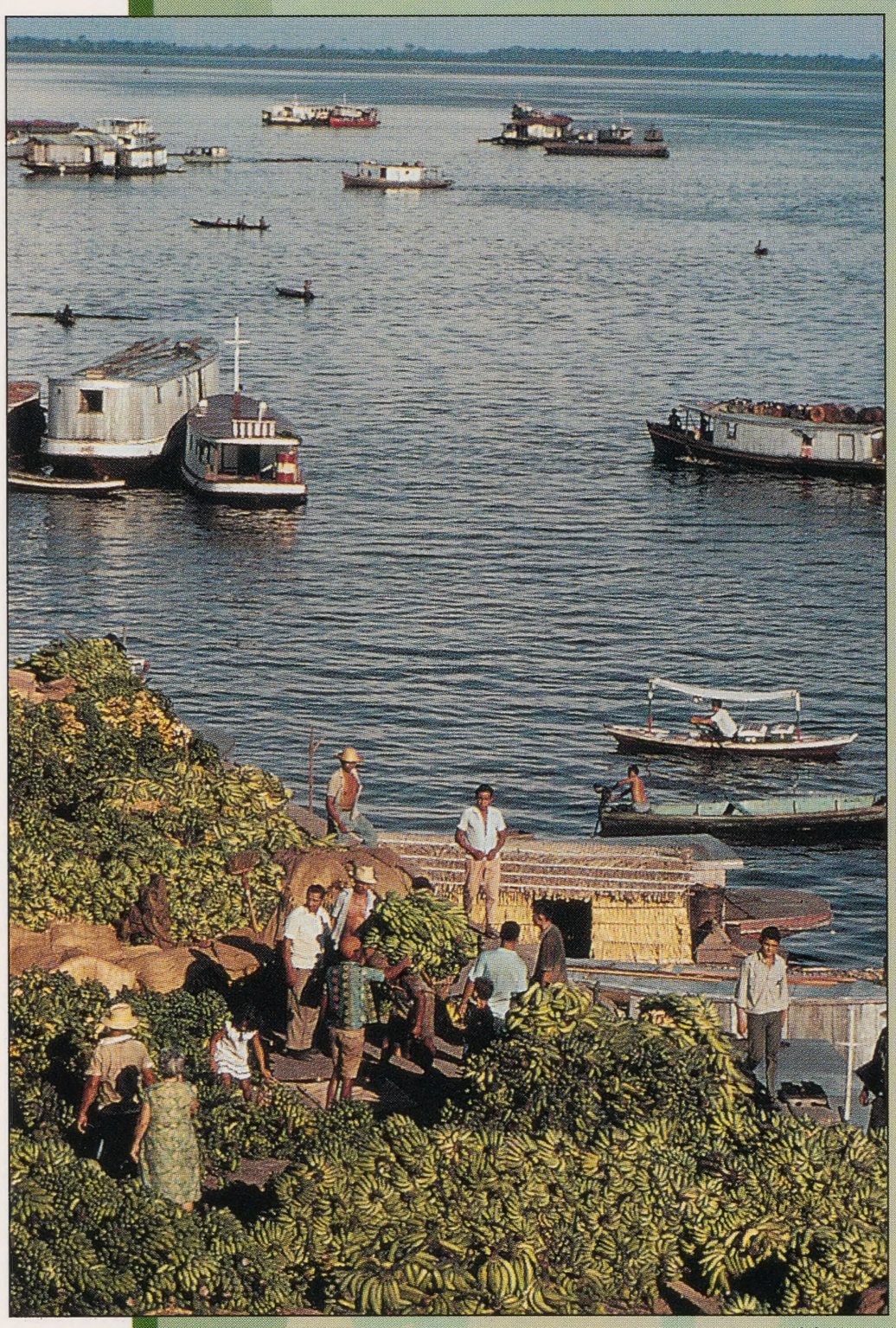
Encompassing more than 2.5 million square miles of river, rainforest, and a wealth of other natural resources, the Amazon Basin—Amazonia—forms the world's most diverse ecosystem. Untold numbers of species—millions of different kinds of plants and animals—live in Amazonia, bound in infinitely complex, intimate interrelationships, the knotted threads of which scientists are just beginning to unravel. Through the marvels of modern engineering we have explored distant planets, but remote areas of Amazonia remain unknown, perhaps never even seen by human eyes.

Yet Amazonia is not without people. People have lived off the bounty of Amazonia for perhaps 20,000 years. When Europeans found Amazonia 500 years ago, it supported six million people. Few descendants—only about 250,000—of these indigenous peoples survive today, but they have been replaced by 17 million others, largely of European and African ancestry, who are struggling to survive in an environment from which many remain alienated. But this is where they live. And ultimately it is how these people adapt to Amazonia, how they learn to prosper by using river, rainforest, and natural resources without destroying them, that will determine the fate of all the rest of Amazonia's species.

The Zoo's exquisite new *Amazonia* habitat exhibit offers us the opportunity to experience Amazonia, to explore the flow of the river, the otherworldliness of the canopy, the wealth of biological diversity, and the lives of the people who live there. Here, in the pages of *ZooGoer*, we offer a glimpse of the place that is Amazonia.



Michael Friedel



Loren McIntyre

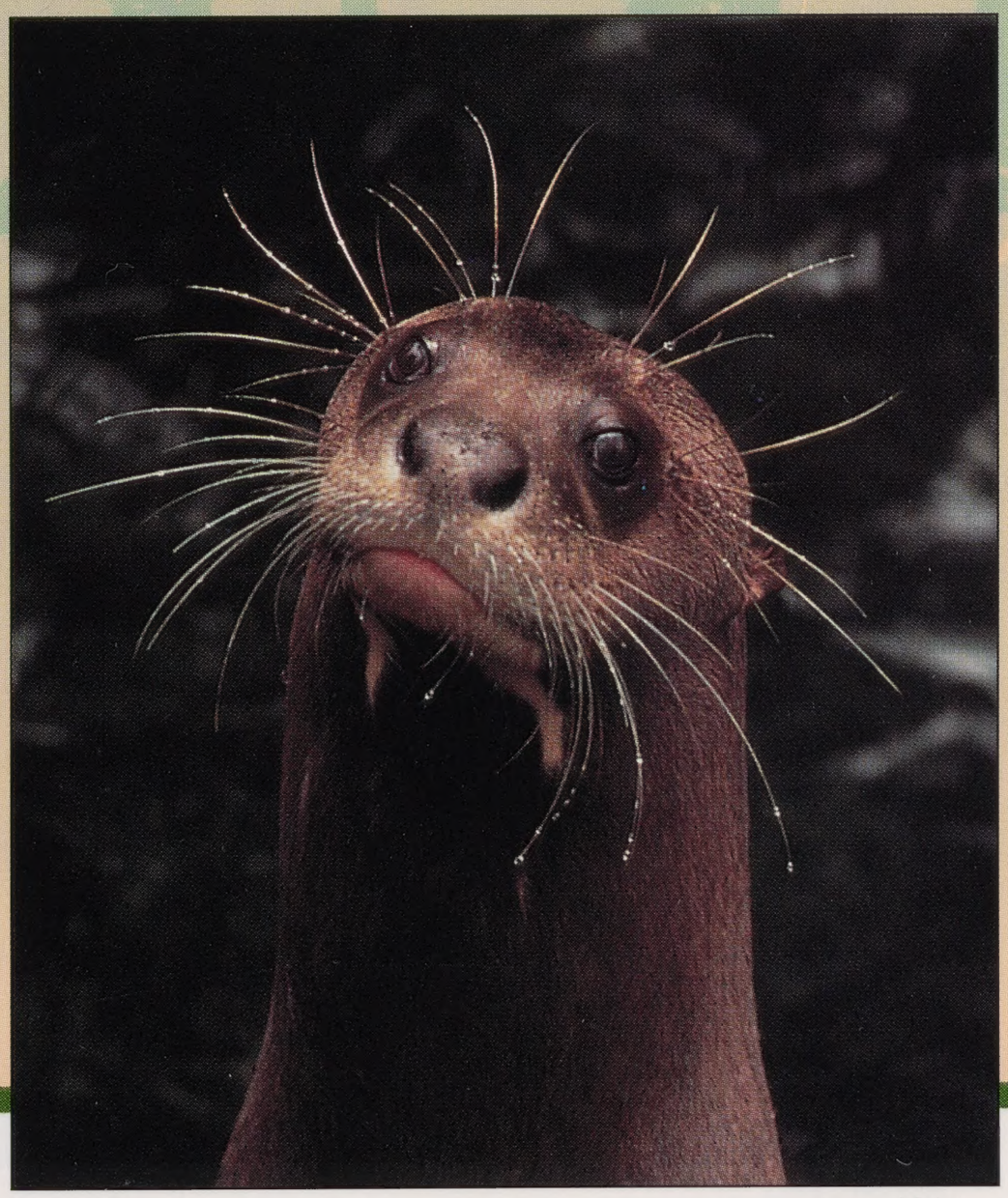
Surrounded by rainforest, the city of Manaus lies at the center of Amazonia, some 2,000 miles up the Amazon at the confluence of the Rio Negro and the Rio Solimoes. With a population of more than one million people, Manaus is the commercial center of the upper Amazon region and a bustling river port that accommodates oceangoing ships. Founded by the Portuguese in 1669 to protect the slavers who hunted Indians living along the river, Manaus achieved prominence during the rubber boom of the late 1800s, when for a few years it was one of the richest cities in the world. Today, Manaus is a major manufacturing center from which other development activities radiate, activities that often are destructive to the rainforest.

Loren McIntyre

Fed by 80 to 120 inches of precipitation each year, the Amazon is the world's greatest river system. The Amazon River discharges more than four times the amount of water as the Zaire (Congo) River, which discharges the next largest amount, and about 11 times what the Mississippi discharges. Seventeen of the Amazon's 1,000 or so *named* tributaries are more than 900 miles long, and the system includes about 50,000 miles of navigable waterways.

Loren McIntyre

People who live along the Amazon and its tributaries have learned to adapt to the annual floods that raise water levels between 20 and 50 feet and inundate the forest as far as 20 miles on either side of the main river channel. Seasonally flooded forests make up only about two percent of the basin, but land flooded by silt-laden whitewater rivers, known as *varzea* forest, is far more fertile than *terra firma* forest or forest flooded by blackwater rivers, known as *igapo* forest. However, people who farm the alluvial soils of the varzea forest must move to higher ground during the months their land is underwater.



Loren McIntyre

Giant otters (*Pteronura brasiliensis*) have all but disappeared from the rivers of Amazonia, victims of fur traders and of local people who perceive them as competitors for fish. Giant otters live and travel in noisy, conspicuous groups and are active during the day. These traits, coupled with the accessibility of their riverside habitat, make giant otters easy to find and kill. They survive today only in a few remote protected areas.

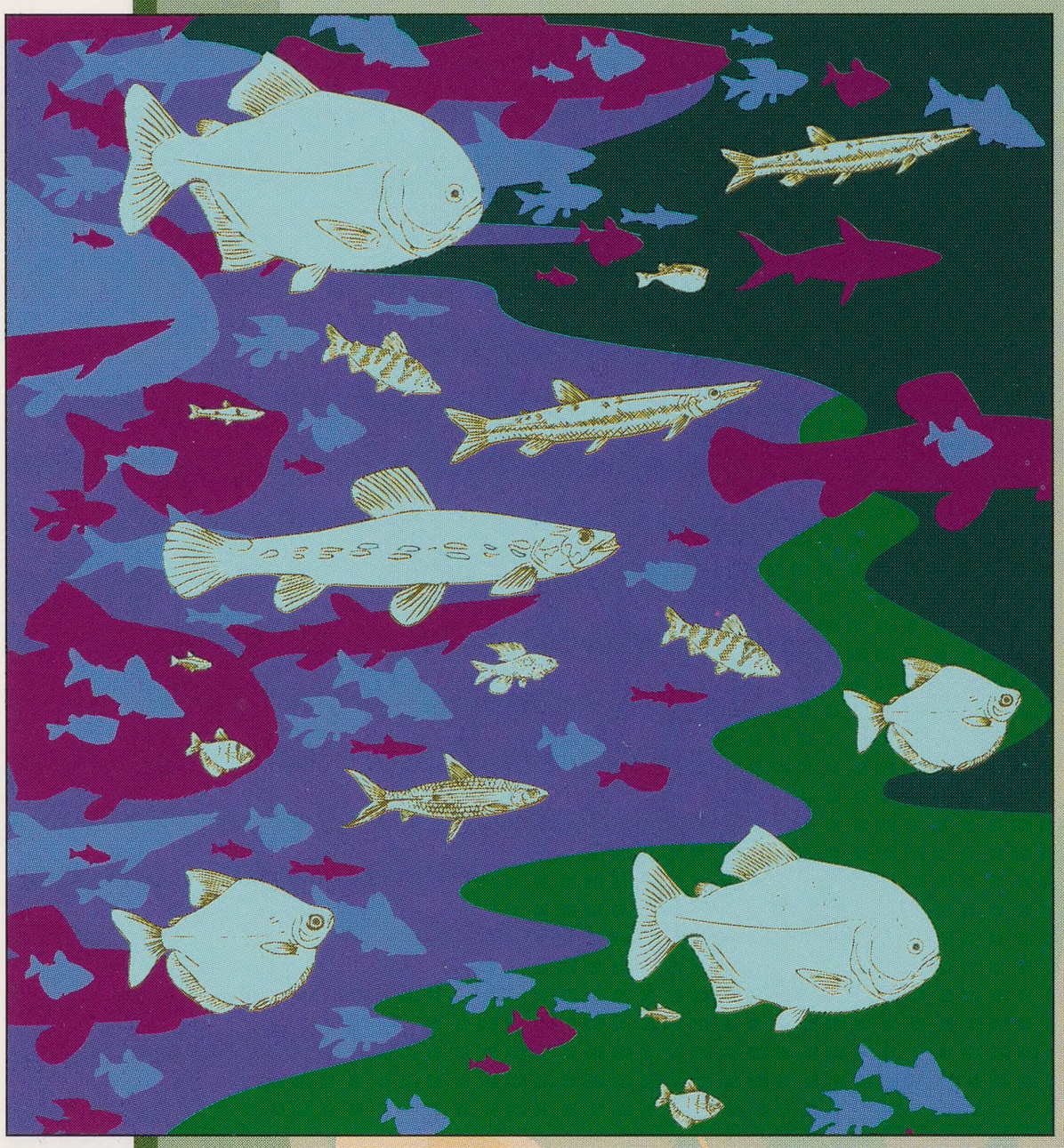


Illustration: Warren Cutler/NZP Graphics
Design: Richard Cress/Miles Fridberg Molinaroli, Inc.

More species of fishes inhabit the Amazon and its countless tributaries than inhabit any other of the world's freshwater ecosystems. Scientists estimate the total number at between 2,500 and 3,000 species—ten times the number living in the Mississippi. Most—perhaps 80 percent—of the species belong to one of two groups: characins and catfish. Tetras and piranhas are characins familiar to aquarium hobbyists, but the thousand or so species in Amazonia include three-foot-long "dog tooth" fishes, named for their huge caninelike teeth, and small hatchet fishes that are capable of short flights out of water. The catfishes are also extremely diverse, ranging in size from tiny, three-quarter-inch-long, bloodsucking candirus to the six-foot-long, 300-pound monsters known as piraiba.

Jessie Cohen/NZP Graphics

Temperate-zone forests are usually classified according to the two or three tree species that predominate: oak/hickory forest, for example, or spruce/hemlock. No such classification is possible for tropical rainforests, where, in a long walk, one might never see two trees of the same species. In the Amazonian rainforest, scientists counted 245 tree species in a 2.5-acre plot in Ecuador, and 283 species in a similar-sized plot in Peru. The total number of plant species in 2.5 acres of rainforest, an area about the size of two football fields, is at least an order of magnitude greater.

"A very remarkable feature in these trees is the growth of buttress-shaped projections around the lower part of their stems. The spaces between these buttresses, which are generally thin walls of wood, form spacious chambers, and may be compared to stalls in a stable: some of them are large enough to hold half a dozen persons." —*Henry Walter Bates, 1863*

Trees in the Amazonian rainforest may grow as tall as 200 feet; above-ground buttress roots help prevent these huge, but shallow-rooted trees from toppling over. The roots of rainforest trees are shallow because most of the decaying organic material trees need for food is at the surface and in the first few inches of soil. Rainforest soils, called oxisols, are old and extremely poor as a result of years of leaching away of nutrients by rainfall. The rainforest's topsoil layer is only about four inches deep; in contrast, topsoil may be one to two feet deep in temperate deciduous forests.

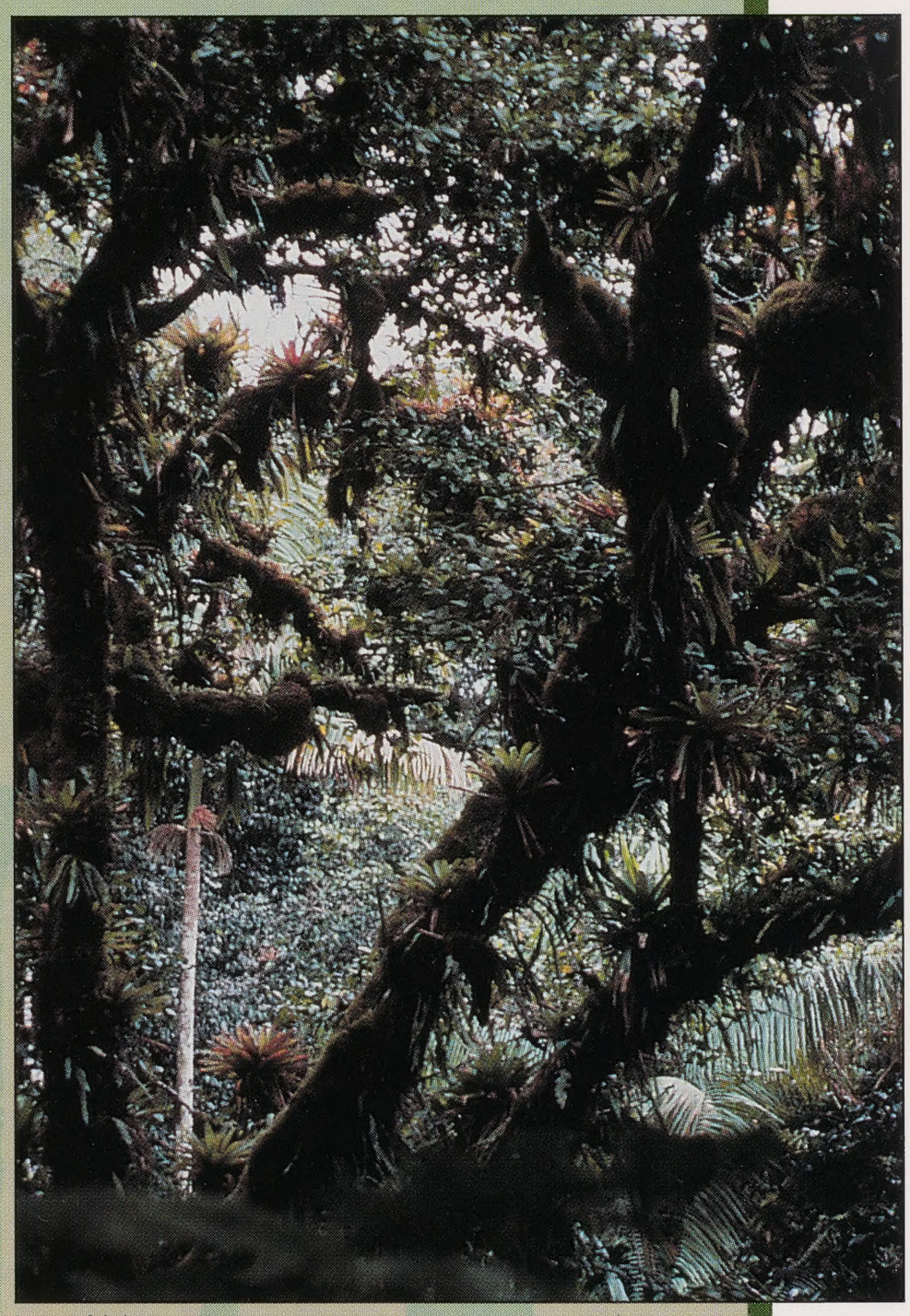
Jessie Cohen/NZP Graphics

"The tropical wet forest is ecologically a desert covered by trees!" —*R.J.A. Goodland and H.S. Irwin, 1975*

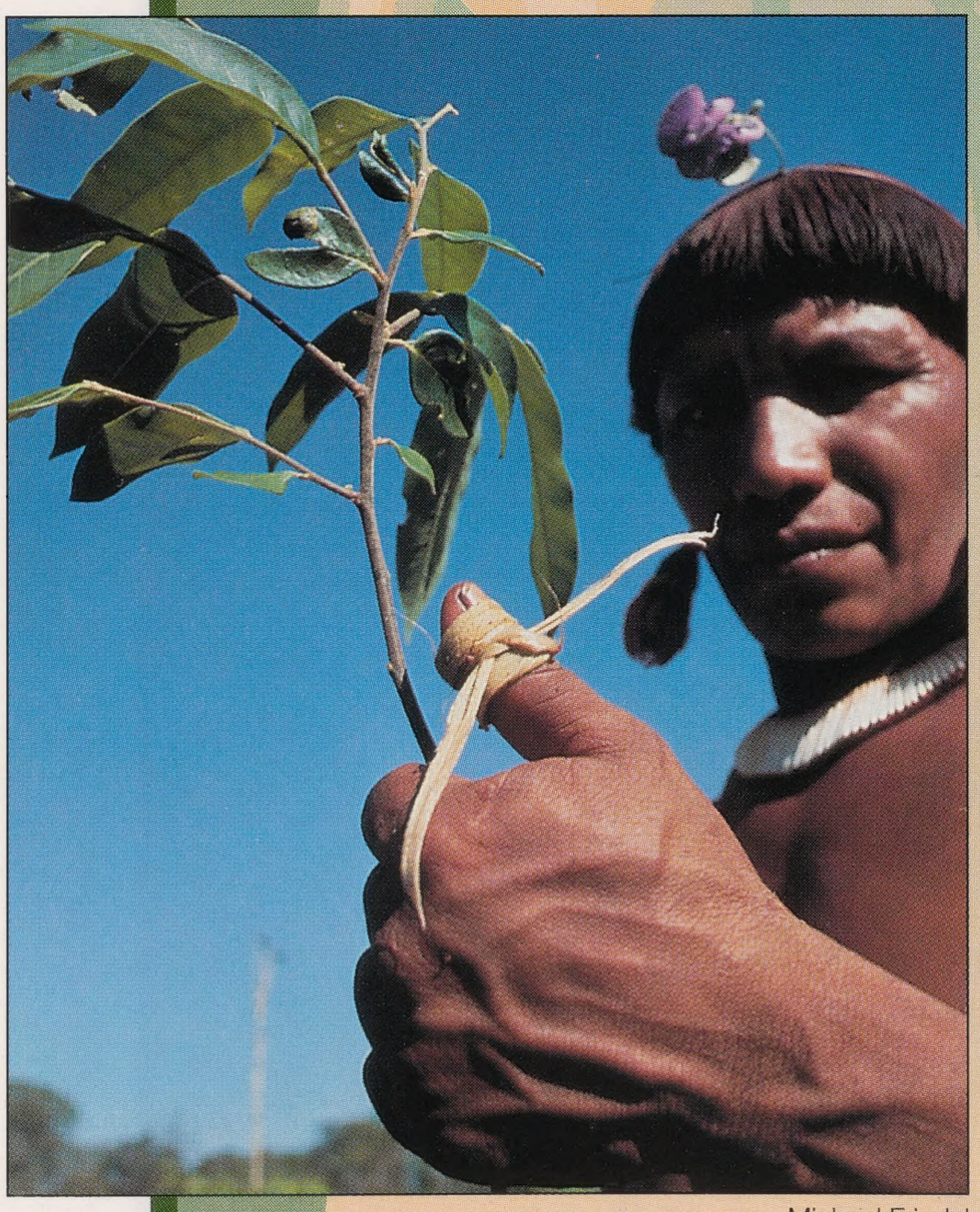
Although most people imagine the rainforest as a thick green jungle only to be pushed through with the aid of a machete, the floor of unbroken rainforest is surprisingly open, even barren. In fact, the "jungle" is all overhead—some 100 to 200 feet above the ground in the rainforest canopy, where a tangle of woody lianas and a miniature forest of epiphytes cover and connect the leafy branches of the trees. Seen from above, the canopy appears as a vast green meadow, studded with brightly colored wildflowers. And it supports a stunning array of animals, from beetles and butterflies to tamarins, toucans, and three-toed sloths. The canopy, which captures most of the sunlight and thus carries out most of the photosynthesis in the rainforest, also feeds terrestrial animals and fish with the fruits, nuts, seeds, and leaves that fall to the ground or into the river.

Loren McIntyre

The trees of the Amazonian rainforest are festooned with epiphytes—plants that escape the gloom of the forest floor by growing on other plants, usually in the canopy. Among the epiphytes are species of algae, mosses, fungi, ferns, lichens, and liverworts, and of flowering plants such as orchids, anthuriums, bromeliads, gesneriads, and cactus. Epiphytes, which usually do not take nutrients from their host plants, have evolved a variety of ingenious methods of obtaining nutrients. Some epiphytes enjoy a symbiotic relationship with ants: Ant nests are good germination sites for seeds and provide nutrients, while the roots of the plant provide a substrate and reinforcement for the nests. Other epiphytes, known as trash basket plants, "collect" organic debris in baskets formed of aerial roots. The debris then breaks down into humus from which roots can take up nutrients.



Loren McIntyre



Michael Friedel

"Antibiotics, fungicides, insecticides, viricides, new products, new crops, and a vast genetic bank are just part of the intellectual and practical harvest that awaits prudent exploitation of the forest. If we destroy it we will lose forever more information than is contained in all the libraries on our planet."
—*Michael Robinson, 1992*

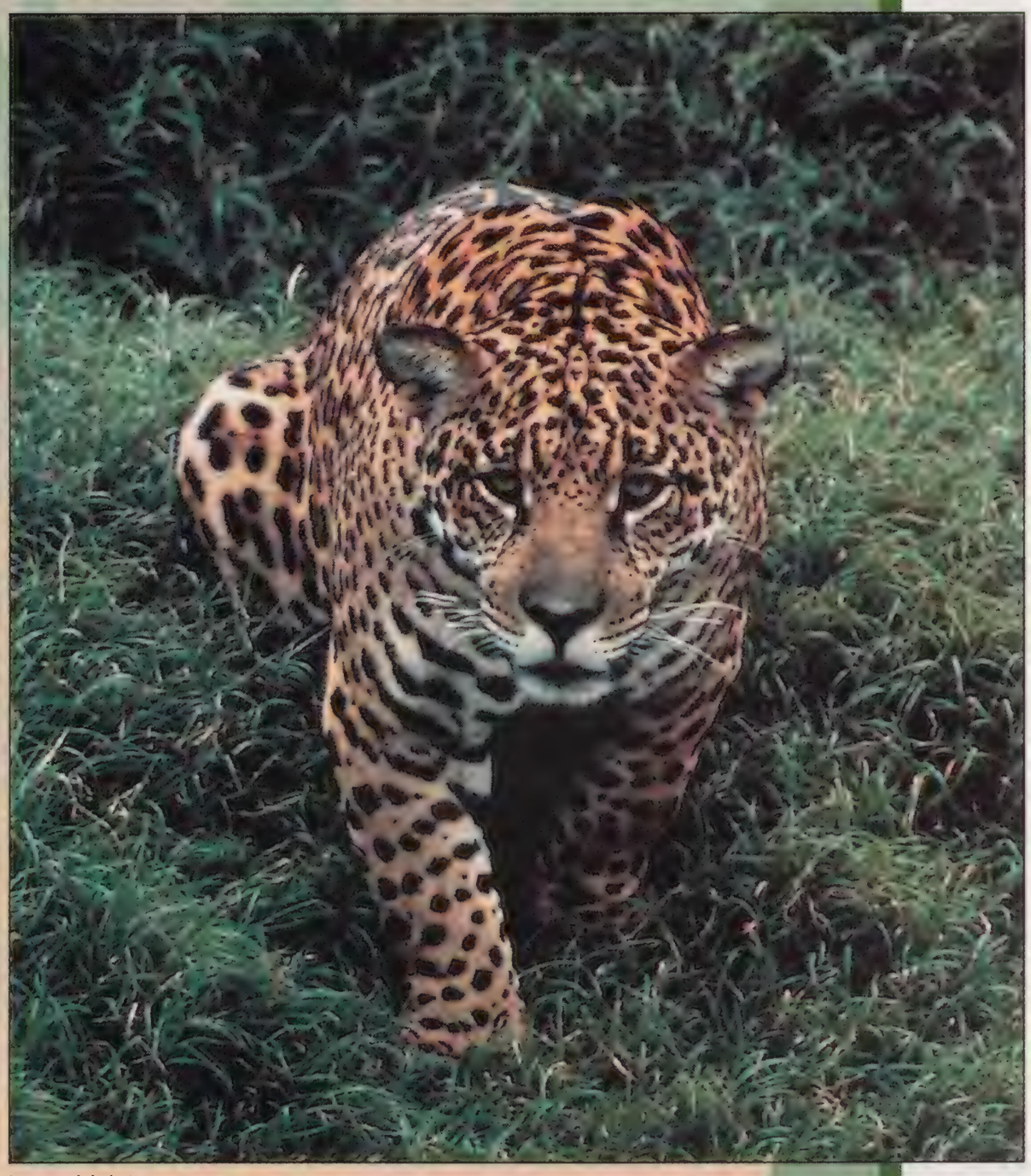
The indigenous peoples of Amazonia use an incredible array of plants for food, fuel, tools, shelter, crafts, and medicines. By one estimate, as many as 25,000 different species of plants potentially useful to people grow in the Amazon Basin. Only a few of these have been widely exploited, but their products are extremely important: rubber, chocolate, manioc, Brazil nuts, curare, and quinine. Today, many scientists are examining rainforest plants looking for new treatments for cancer and other diseases. Learning how indigenous peoples use various plants for medicinal purposes will greatly aid this effort. Unfortunately, much of this traditional knowledge may already have been lost with the extinction in the last few centuries of hundreds of Amazonia's ethnic groups.

Loren McIntyre

The waters in many of Amazonia's rivers are nutrient-poor. As a result, these blackwaters and clearwaters lack aquatic vegetation and plankton for fishes to feed on. Instead, many species of Amazonian fishes eat fruits, nuts, and leaves that fall into the water from the trees that overhang the riverbanks, or that fish can reach themselves when the forest is flooded. Many species eat only when the forest is flooded, living on fat reserves the rest of the year. Tambaqui (pictured here), for instance, live on the seeds of rubber trees and thus the survival of this commercially important food fish depends on the survival of the forest. Many species of piranhas are also fruit and nut eaters; in fact, some scientists speculate that their fearsome teeth evolved primarily to cut fruit not flesh.

"We were disappointed also in not meeting with any of the larger animals in the forest. There was no tumultuous movement, or sound of life. We did not see or hear monkeys, and no tapir or jaguar crossed our path. Birds, also, appeared to be exceedingly rare." —*Henry Walter Bates, 1893*

In fact, Amazonia is home to about 800 species of mammals and 2,000 species of birds, but it is true that, aside from insects, visitors to the rainforest see little of the region's incredible diversity of animals. Individual birds and mammals are usually widely dispersed as well as reluctant to make themselves conspicuous to people. Only one jaguar, for instance, might be found in a 12-square-mile area. What's more, most rainforest birds and mammals live high in the canopy, seldom if ever coming to the ground. All of Amazonia's 36 or so species of monkeys, for instance, live in trees.



Loren McIntyre

Loren McIntyre

"One lives there [in Manu, in Peruvian Amazonia] by the tacit acquiescence of unseen and totally wild human beings. Now and then we come upon a trail of footprints, or a makeshift overnight lean-to on a beach. Once a pair of naked figures sprinting for cover. Nothing more. They are around us, and they know we are there. But we don't know who they are, where they live, or even what language they speak." —*John Terborgh, 1983*

Only a few "wild people," as yet uncontacted or uninfluenced by Europeans, still live in the rainforest as their ancestors have for millenia, but many indigenous tribes are struggling to preserve their land and culture against the onslaught of settlers, loggers, and others attempting to exploit the forest.

Amazonia, the largest and most complex exhibit ever built at the National Zoo, opened to the public on Wednesday, November 18. The 15,000-square-foot rainforest habitat portion of the exhibit includes a cascading tropical river and a 55,000-gallon aquarium for the display of Amazon River fish. Within *Amazonia's* dome, visitors will find a living tropical forest with more than 350 species of plants including 50-foot-tall trees, tropical vines, and epiphytes. The exhibit is also home to dozens of species of mammals, birds, reptiles, amphibians, and insects typical of the Amazon Basin.

Visitors can explore the field station of Dr. Brasil, an imaginary biologist whose equipment, notes, and specimens shed light on the exciting scientific work being carried out in this infinitely complex environment. *Amazonia* staff and volunteers from Friends of the National Zoo circulate throughout the exhibit, answering questions and pointing out aspects of the habitat's plants and animals that are not easily recognizable to the unpracticed eye.

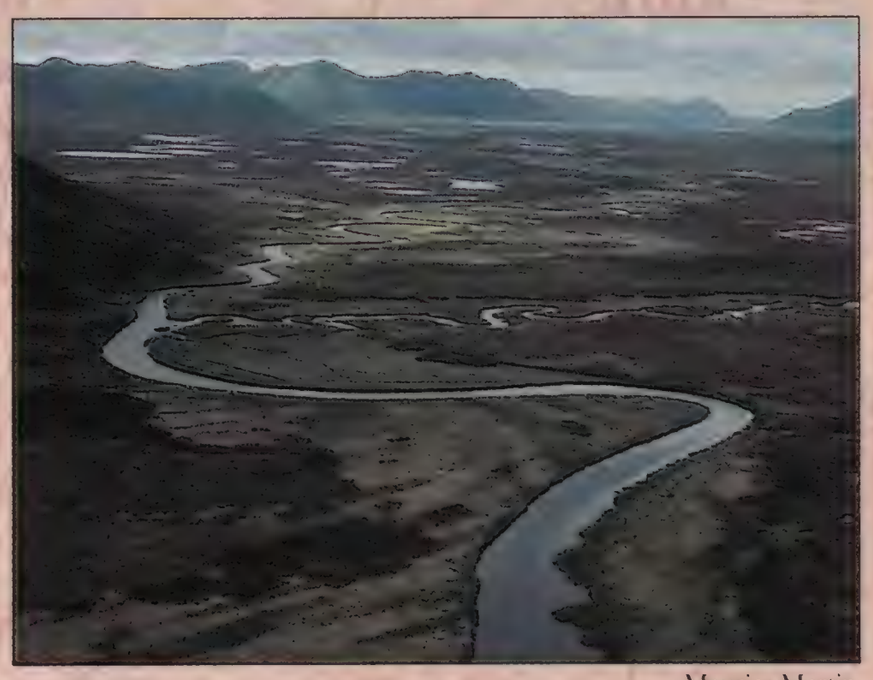
The *Amazonia* exhibit will be completed in late 1993 or early 1994, when the 10,000-square-foot educational gallery is opened in the hall adjoining the rainforest habitat. The gallery will include exhibits that look at biological processes that take place in the rainforest, Smithsonian research in Amazonia and other tropical rainforests, and up-to-the-minute information on environmental events in Amazonia and throughout the world.

Jessie Cohen/NZP Graphics

CARVING UP KODIAK

On the wall of the Kodiak National Wildlife Refuge headquarters hangs a giant map of Kodiak Island that assistant refuge manager Dick Munoz uses to illustrate the problem facing the Kodiak bear. Along Uyak Bay and Larsen Bay on the island's western flank, about 200 10-acre plots of pristine wilderness were recently deeded, some of which have already been put up for sale. Over on Thumb Lake, a cabin has been built 12 feet from a bear trail leading to one of the refuge's richest salmon runs, an area that may have the highest seasonal density of brown bears in the world. At the mouth of the Ayakulik River, there's talk of building an airstrip that would bring an army of sport fishermen, hikers, and hunters to the western shore.

Pointing to the yellow areas of the map, Munoz indicates tracts of privately owned land that until 1971 were part of the refuge system, and explains why they must remain wild for the bear habitat to remain intact. "It looks like we have a lot of white space," says Munoz, pointing to the remaining 1.6 million acres of refuge land spread across Kodiak and two other nearby islands, Uganik and Afognak. "But it's important to think about access points."



Maurice Martin

The yellow areas hug the island's lakes, rivers, and bays. Since the only roads on Kodiak run along the far northeast shore near the city of Kodiak, human access to the back country means boat or float plane, right into those yellow areas. Bears need these same areas to exploit their main food source—the island's teeming salmon runs. "And people tend to land in areas where the fish are concentrated, because that's where the fishing is best," says Munoz. "That's where the bears want to be also. Everyone is focused in these key areas."

These key areas—lands referred to as "inholdings"—were part of the refuge when it

Maurice Martin

In the Kodiak National Wildlife Refuge, if a bear wants your fish or the deer you just shot, you're obliged to give it to her. (D. Menke)

was formed in 1941, and, like the rest of the refuge, were under control of the U.S. Fish & Wildlife Service. In 1971, an act of Congress caused these acres to become privately owned land. Now they're prime real estate, and airstrips and hunting lodges may soon replace dark stands of Sitka spruce and salmonberry bushes. If that happens, concentrated human activity in the inholdings, spilling over onto refuge lands, would have serious ramifications for the refuge's status as prime bear habitat.

Along the snow-mottled mountain ridges, hikers may startle grazing mountain goats or Sitka black-tailed deer; and those who arrive on the island by ferry from Homer or Seward often see the white, plumed exhalations of humpback whales and porpoises pacing their ship.

Paradise Under Pressure

Kodiak Island is now one of the best habitats for brown bears; because of the abundant supply of fish and berries, the Kodiak "brownie" grows to extraordinary size. Male specimens can weigh up to 1,500 pounds in autumn, just before hibernation, and large females can weigh up to 600 pounds. Though Kodiak, brown, and grizzly bears are all the same species, *Ursus arctos*, Kodiak Island's bears form an isolated population that scientists identify as a subspecies, *Ursus arctos middendorffi*. Between 2,500 and 2,700 bears make their home inside the refuge.

What's at stake on Kodiak is more than just a place for bears, although President Franklin Roosevelt established the Kodiak National Wildlife Refuge primarily for their sake. Other animals flourish there as well, most notably 350 to 400 nesting pairs of bald eagles; it's not unusual to see one wet its talons in a clear inland stream trying, like the humans and the bears, to catch a fat

salmon for dinner. Beaver keep a wary eye on nearby fly-fishermen, spanking the water with their tails and diving when approached. Along the snow-mottled mountain ridges, hikers may startle grazing mountain goats or Sitka black-tailed deer; and those who arrive on the island by ferry from Homer or Seward often see the white, plumed exhalations of humpback whales and porpoises pacing their ship.

Last year, President Bush ranked Kodiak Island and its brown bears among the "crown jewels of America's National Wildlife Refuge system." Why then are marketing specialists staking out potential recreation centers there? The answer lies in the area's history—in particular, the federal government's relationship with the Native peoples of Alaska, which began when the United States purchased Alaska from Russia in 1867.

At that time, the federal government recognized the claims of Native peoples to certain areas of the Alaska territory, but did nothing to establish legal ownership of the land. Despite Native protests, Congress left the issue unresolved for 104 years, and did not act until Native land claims threatened to stop work on the Alaska pipeline. By that time, wildlife refuges had been established; some, like the one on Kodiak, included land traditionally used by Native villages.

The Alaska Native Claims Settlement Act (ANCSA) of 1971 created several Native-owned corporations: 12 representing different regions, and more than 200 representing individual villages. These corporations received a total of 44 million acres traditionally used by the villages and regions they represent, and a total of $962.5 million in cash spread out over a number of years. Supporters of ANCSA touted it as a sensible alternative to the Indian reservations created in the Lower 48—Native-owned corporations were to develop their land for profit, making the Alaskan Natives economically self-sufficient and part of the mainstream culture.

But ANCSA created a new problem on Kodiak. As Jay Bellinger, manager for the Kodiak National Wildlife Refuge says, "It's a shame the Natives weren't given a choice of where they could pick their land—they had to pick sites near their villages. So, on Kodiak, they had to pick a significant part of their acreage within the refuge." About 310,000 acres went from being part of the government-controlled refuge lands to Native corporation inholdings.

The Case of the Ayakulik

The Ayakulik River provides a small-scale example of how development will affect areas across the island. The bulk of this 45-mile-long river meanders through refuge land between grass-covered hills. Its mild current and lazy curves provide excellent fishing holes full of king and red salmon. And, like many spots on Kodiak and other nearby islands, the banks of the Ayakulik hold an archaeological treasure. A population of 1,000 to 2,000 Natives lived there from approximately 800 to 200 years ago, sustaining themselves by fishing, hunting bears and sea lions, and gathering salmonberries and other edible plants. Their village, long abandoned, lay forgotten by both Natives and whites until just a few years ago.

Access to the Ayakulik is by float plane near its confluence with Bare Creek, where the river straightens out just enough for a rough, Alaska-bush-pilot-style landing. After unloading your rubber rafts, tackle, and camping gear, you leisurely make your way downstream, grinding over the flat, gravelly stretches, stopping at any sandy curve or muddy bluff where it looks like the salmon may be striking. In the gray twilight that passes for a summer evening on Kodiak, the smell of cooking salmon—caught only hours earlier and grilled with the skin still on—mixes with that of brewing coffee in the fresh wind.

Encounters between bears and humans occur frequently along the Ayakulik. Paddling your raft downstream, you may see a hefty, 300-pound three-year-old crashing through the shrubs along the bank, or an older sow bouncing away with a salmon in her jaws, glancing over her shoulder, worried that you may try to take her fish.

Walking through the abandoned Native village, which rests on a raised, earthen bank near the river, you'll see a series of wide, shallow depressions overgrown with weeds. These are the remains of collapsed *barabaras*—the semi-underground dwellings created by the Native people in ancient times. Some bears take refuge in these barabaras; you can see hourglass-shaped spots where the grass has been matted down by their heavy bodies. Bears like the barabara pits for the same reasons the hu-

The Kodiak National Wildlife Refuge is also home to 350 to 400 nesting pairs of bald eagles. (D. Menke)

mans did: They offer shelter from the wind, a good vantage point, and easy access to food and water.

At any time during the fishing season, there may be more than 40 people camping on the Ayakulik between Bare Creek and the beach where the river empties into the Pacific Ocean. This human presence can be fairly intrusive—rounding a seemingly remote and pristine wilderness bend, you suddenly come upon a party of sportsmen grousing over the day's poor catch and wary of anything that looks like a bear.

Some carry guns, a natural precaution in an area with one of the highest densities of bears in the world—Kodiak averages about one bear per 1.5 square miles. However, it is illegal to defend your hunting or fishing trophies against a bear; if a 600-pound bear sow wants your fish or the deer you just shot, you have to give it to her. You can only shoot a bear out of season in self-defense, and then you'll have to prove to the fish and wildlife protection branch of the state troopers that the bear threatened your life or property. Still, some people panic, others unwittingly tempt bears toward their camp by leaving excess food around, and others just don't care about the law. As many as eight bears have been reported shot in defense of life and property in one recent year, and probably only half of those shot are reported.

But even more important, says Bellinger, "brown bears are a wilderness-dependent species. They never do well around a population of people." The strictly controlled bear-viewing programs run by the state at McNeil River and a similar trial program run by the refuge at O'Malley River provide public access to bears in a controlled situation that officials hope does not displace the bears. By putting participants on a viewing platform, and controlling the timing and behavior of the viewers, the program makes the human intrusion consistent. But along the Ayakulik, sportsmen roam about freely and in greater numbers, intruding on the bears' daily routine.

Much of Kodiak's back country is accessible only by boat or float plane. (Maurice Martin)

It adds up to one thing: too many people will crowd bears off of the Ayakulik River. Whenever there's a conflict, the bears will lose in the long run, either by being shot or hounded away from their feeding grounds.

The Airstrip Alternative

As it is, there's a natural limit on the number of people who can float down the Ayakulik. The river empties into the ocean between two high cliffs. Most sportsmen fly out, so exiting the river means waiting for fair weather. Even then, takeoff from the rocky beach is a hair-raising event, because strong downdrafts from the nearby cliffs threaten to flip the overloaded, single-engine crafts and drive them back down into the rocks and surf. Unless they have a flexible schedule and a strong stomach, most anglers opt for more accessible vacation spots.

Still, so many people float the Ayakulik the refuge management has established a camp along the river to study its usage. Over the next few years, the refuge will determine what restrictions need to be placed on the Ayakulik and other river systems to maintain both the habitat and

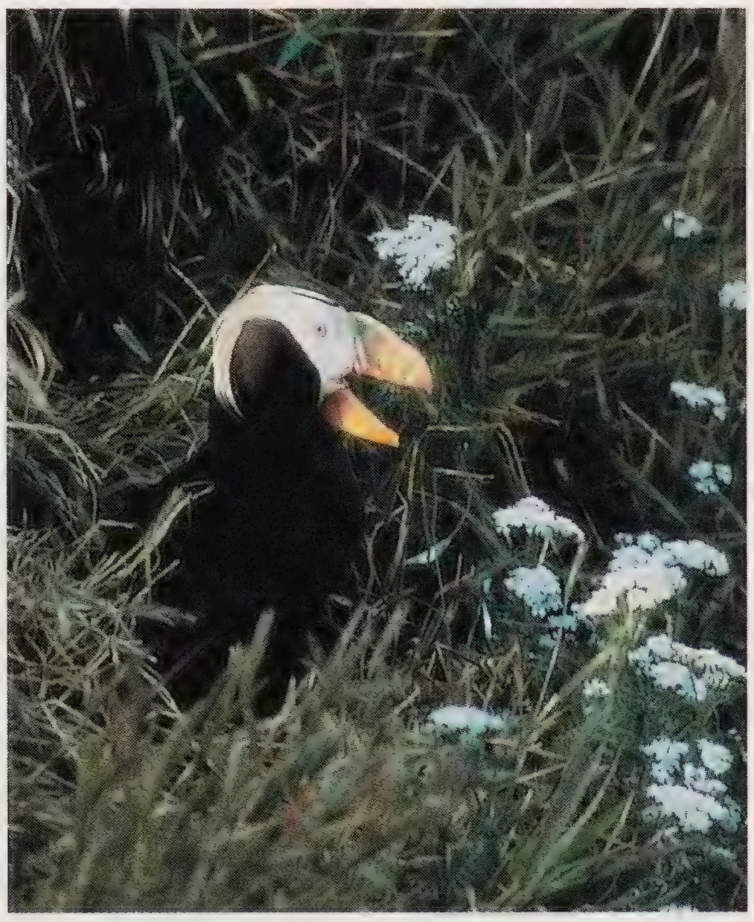
the quality of the wildlife experience for people who go there.

However, the situation at the Ayakulik may change before that. Although most of the river lies within the refuge, 420 acres at the mouth are owned by Ayakulik, Inc., a Native corporation whose shareholders live in the village of Akhiok on Alitak Bay. Ayakulik, Inc., is considering bulldozing one of the cliffs to put in an airstrip and a sportsmen's lodge. If that happens, the trickle of humans on the river will become a gush. As one observer puts it, "with an airstrip on the beach, you could float an army down the river every day."

No one wants to see this happen, least of all the Native owners of the land. Ralph Eluska represents Ayakulik, Inc., and is president of Akhiok-Kaguyak, Inc. (AKI), another Native corporation whose shareholders live in Akhiok. "We hope that the government will reacquire both the AKI and Ayakulik, Inc., inholdings," says Eluska.

He and the shareholders he represents recognize that the precious, pristine nature of the land will be lost if development plans go forward. For the last eight years, the hope of government reacquisition "has been the sole reason for us not pursuing our development opportunities," he says. Reinvesting proceeds from the sale of their land to the government would allow AKI and Ayakulik, Inc., to achieve the ANCSA-assigned mandate of economic self-sufficiency. But so far, the government has balked at the price tag—a buy out of all Native inholdings on the island would cost about $200 million.

Across Alaska, other Native corporations reap the benefits of their ANCSA land by harvesting timber, minerals, and fish. Meanwhile, the citizens of Akhiok continue a subsistence lifestyle, getting seasonal work on fishing boats or in canneries. Many are on public assistance and live in HUD-subsidized houses. As time goes on, they are more eager to take control of their economic future. "To the shareholders, development would mean pride in the ownership of a business and job opportunities for our people," says Eluska. "And it's getting harder for us to believe that reacquisition by the government is going to happen."



Tufted puffins. (D. Menke)

Making a Federal Case?

Other Kodiak Natives are also actively seeking some kind of return on their ANCSA land. Those around Larsen Bay recently divided up their inholding land there and along Uyak Bay to individual shareholders, some of whom have put their property on the market.

A family of bears near Frazer Lake on Kodiak Island. (D. Menke)

The presence of increasing numbers of sport fishermen along Kodiak's teeming salmon runs has put pressure on the island's bear population. (B. Dean)

Recently, the Kodiak *Daily Mirror* real estate listing included a plot of inholding land formerly owned by the Larsen Bay Native corporation—12 acres on Uyak Bay—for $30,000. One shareholder built a cabin on his 10-acre plot, which he plans to rent out to deer hunters. "If a majority of those get sold and get different kinds of development on them—commercial cabins, lodges, year-round residences, whatever—you can just take a big hunk of that area and chalk it off for brown bear," says Bellinger.

The Kodiak National Wildlife Refuge has a legal tool with which it may try to halt development of inholding land. Congress, foreseeing a conflict between wildlife refuges and land development, attached a string to former refuge land passed out by ANCSA. Section 22(g) of ANCSA states that if a village corporation receives land within the National Wildlife Refuge system, the U.S. has the right to repurchase the land if the Natives ever offer it for sale.

The Karluk Lake area has a high priority, owing to the fact that it includes some of the best bear habitat on the island. Acquisition of the 420 acres at the mouth of the Ayakulik would make that river the one important salmon stream entirely within the refuge.

Furthermore, 22(g) specifies that even if the government does not repurchase the land, it must "remain subject to the laws and regulations governing use and development" of the refuge. In other words, it cannot be developed commercially.

Section 22(g) would therefore squash plans for an airstrip at the mouth of the Ayakulik. It could also be applied to the Larsen Bay inholdings if the argument is made that all the small parcels being sold off will have a cumulative negative effect on the habitat.

Last year, Koniag, Inc., the regional Native corporation for Kodiak Island, built a cabin on tiny Thumb Lake, 12 feet from a bear path leading to one of the richest salmon runs on the island. Bellinger cited Koniag for violation of 22(g), and this citation has been passed on to the regional office of the National Wildlife Refuge system. If the case goes to court, it will be the first test of 22(g) on Kodiak. However, the results may not be good for the refuge.

"If there's a court battle, we'll win it," says Uwe Gross, CEO of Koniag, Inc., "and the refuge won't have any protection on the private inholdings." Indeed, two strong legal arguments could be used to overturn 22(g): By definition, restrictions on public land use do not apply to private lands. Also, a later law, the 1980 Alaska National Interest Lands Conservation Act (ANILCA), explicitly states that inholdings are not subject to public land regulations. If a court declares 22(g) invalid or inapplicable, developers who had previously been scared away from Kodiak by 22(g) would rush in; the floodgates of development would be open.

Even if 22(g) were upheld, it runs counter to the goal of ANCSA, which was to give Natives the opportunities to generate profits for their corporations—and ultimately dividends for their shareholders—by using their land. "We got the land, but 22(g) says we can't do anything with it," says Eluska. "If they don't allow us to develop, and they don't reacquire the property, then really what did we get in the settlement?"

Priority Parcels

Government reacquisition of the land could be, as Bellinger puts it, "a win-win situation." Not only would it ensure the land's

continued service to the refuge, but, since Title A of ANILCA guarantees Native subsistence hunting and fishing rights on government land, it may also help preserve some of their traditional lifestyle. "I personally can't think of a better utilization of that land than having it back in the public domain," says Gross. "That would serve all of our shareholders in the best possible way."

The government may not even have to raise the cash for the deal. A land swap for Kodiak inholdings wouldn't cost the government anything, and could provide the Native corporations with land outside the island of equal value to the inholdings. Between Savings & Loan bailout properties and newly shut-down military bases, the U.S. government currently has lots of land with which to deal. Or, funds from the Exxon Valdez settlement—which includes $900 million for the restoration and replacement of natural resources damaged by the 1989 tanker accident—could be used to purchase the land.

There are other options besides government reacquisition—private conservation agencies such as The Nature Conservancy could step in and buy the land. Should any of these plans pan out, the refuge has already identified some priority acquisitions based on location and importance to the wildlife habitat. Generally speaking, the refuge would like to acquire inland inholdings first—especially those inholding plots that are completely surrounded by refuge lands.

Specifically, the Karluk Lake area has a high priority, owing to the fact that it includes some of the best bear habitat on the island. Acquisition of the 420 acres at the mouth of the Ayakulik would make that river the one important salmon stream entirely within the refuge—an important feature for management purposes. The Native corporations may not want to sell their land in the order that the refuge wishes to purchase it, so the acquisition process will probably involve give and take on both sides.

Everyone agrees that if anything will happen to save Kodiak, it will have to happen soon. "If we are to retain our belief that something is going to happen, we would have to see something on the table soon, or at least a very serious promise," says Eluska.

Barring that, AKI and the other Native corporations will proceed with their plans, either selling, leasing, or developing their properties. This summer, AKI built a hunting cabin on South Olga Lakes. Depending on the outcome of the dispute over the Thumb Lake cabin, the refuge managers may also cite this new cabin as a violation of 22(g).

Fortunately, the issue has gotten extensive coverage in the press and on television, and public interest is high. This fall, Congress debated legislation that contained provisions for acquisition of the inholdings. Although the provisions were struck down in the last frantic days before Congress adjourned, its supporters plan to reintroduce the legislation in January. If enough people write to their congressional representatives in support of reacquisition, the deal could move forward within months.

In the meantime, conflicts between sportsmen and the bears pop up all the time. In June, a newly weaned bear wandered near a shelter at the mouth of the Ayakulik and was later found dead, peppered with buckshot. "That lower river really isn't used for feeding," says Bellinger. "But it's a travel lane." He speculates that a bear family traveling through found food from a messy campsite and stayed. "That incident just illustrates that everywhere out there is important to the bears. Human use has an impact."

Ralph Eluska also sees it as emblematic of the bear-human conflict and its inevitable results. "When the bear comes to town," says Eluska, "he's going to lose." ✤

Maurice Martin is a freelance writer living in Arlington, Virginia.

Kodiak Island boasts one of the highest densities of bears in the world. (D. Menke)

On the Bongo Beat

MARGIE GIBSON

Entering the Zoo at Connecticut Avenue, visitors quickly leave behind the brash sounds and sights of the street. They're greeted with bird songs, lush, green-carpeted animal enclosures, towering trees, and splashes of color from the season's flowers. A few steps farther into the Zoo, visitors find a grassy, steep-sloped enclosure, home to a small herd of bongos—strikingly patterned, chestnut-brown and white-striped members of the antelope family.

Bongos' striped coats provide camouflage in the forested habitat of their native range, which stretches discontinuously from Sierra Leone in West Africa to Kenya on the continent's east coast. There, when sunlight filters through trees and creates a dappled effect on the forest floor, the animals disappear into the landscape. At the Zoo, the bongos often congregate in the shady, bare areas just feet from the walkway. Visitors get a good sense of how well bongos blend in—it's easy to overlook these large animals even though they are almost within arm's reach.

Bongo habitat in Kenya's Aberdare Mountains. (John Seidensticker)

This female bongo calf was born at the Zoo last April. (Al Perry)

The bongo's scientific name, *Tragelaphus euryceros*, is derived from the Greek for "goat-deer with wide-spreading horns." Bongos have short hair, and manes that run from their necks all the way down their backs. Their sides are marked with 11 or 12 white stripes, although they rarely have an equal number of stripes on each side. The white chevron on their foreheads, large ears touched at the tips with tinges of cream, and white marking on the legs suggest that they are visually oriented. Their large ears indicate what is probably a very acute sense of hearing.

The bongo's body shape is typical of an animal that spends its time foraging in densely wooded areas. A convex back with high point in the lumbar region allows it to move with its nose close to the ground and its horns tilted back. This wedge shape enables the bongo to move through thick tangles of vines and brambles that are virtually impassable to humans. The bongo rarely jumps over obstacles higher than three feet. Rather, it prefers to slip beneath such obstacles and needs only about two and a half feet of clearance.

Male bongos are generally larger than females, weighing an average of 650 pounds versus 530 for females. Males also tend to be darker in color than females and their coats deepen in color as they age. Unlike most other members of their genus, in which only males have horns, both sexes of bongos have twisted, backswept horns. Bongos are active primarily at night. During the day, they conceal themselves in the forest, alert and ready to flee if any strange sound or scent signals danger. The dense brambles, vines, lianas, and giant nettle bushes that blanket the floor of their habitat almost always ensure that the bongo hears any intruder—human or animal—crashing through the undergrowth long before the intruder gets close.

Bongos are browsers, and eat tips, shoots, and trailers of plants. They use their horns to uproot tender-rooted saplings, a bongo delicacy. They are especially fond of bamboo leaves, rotten bark, and decayed trees that soften and decompose on the forest floor. They have also been observed eating the charcoal of burned trees, probably for its salt content.

A Bongo Birth

The Zoo's herd of one male and two females increased

on April 25 with the birth of a female calf named Etari. (In July, a fifth bongo, a breeding female, was added to the group.) Etari looked much like the adults except for her size and her lighter coat color. Also, she lacked horns, which began to appear as tiny stubs in August.

The baby, although otherwise healthy, had an angular limb deformity in both front legs. This problem, fairly common in horses, results from the growth plates in the long bones of the calf's leg growing faster on one side than the other during the fetal stage. Left untreated, this condition can eventually result in leg curvature.

Zoo veterinarian Scott Citino described the corrective procedure used on the bongo calf. "After X-raying and measuring the angulation of the legs, we made an incision in the side of the leg where growth was the slowest. At the bone, just above the growth plate, we made a T-shaped incision in the periosteum, a fibrous covering over the bone. This procedure releases the periosteum and bone and allows the bone to grow faster at that point." In addition to repeating this procedure for the other leg, Zoo veterinarians removed a small portion of the ulna, the bone in the foreleg.

Until recent decades, these striking but elusive animals were a true curiosity except to people living in their range. Bongos were unknown outside Africa until French explorer Paul du Chaillu brought the first skin back to Europe in the mid-19th century.

Less than three hours after the calf was taken from her mother for treatment, she was back in the enclosure. Now, it appears that both legs are growing normally and no further corrective surgery is needed.

Except for their lack of horns, young bongos look like smaller versions of their parents. (Al Perry)

The history of bongos in zoos is relatively short. Until recent decades, these striking but elusive animals were a true curiosity except to people living in their range. Bongos were unknown outside Africa until French explorer Paul du Chaillu brought the first skin back to Europe in the mid-19th century. The species has lived at the National Zoo only 22 years, although in the 1930s a close relative, the nyala, was one of the prized animals in the collection.

The animal is cloaked in mystery even among some of the local tribes in Africa. Bongos were taboo among the Zande, who believed that eating their meat or even touching them caused leprosy. While the taboo certainly must have helped to maintain a good-sized bongo population in the Zande region, neighboring peoples profited from the Zande's taboo. When bongos fell into pit traps intended for other animals, members of neighboring tribes had no fear about removing the bongo, cutting and drying the meat, and selling it in distant markets.

Before the 1940s, only two zoos—the New York Zoological Park (Bronx Zoo) and the Rome Zoo—exhibited bongos. The New York Zoological Park acquired its bongo, Doreen, after officials there learned that a British big-game hunter, Colonel Percy-Smith, planned an expedition to East Africa. He was asked to capture a living bongo for the Bronx Zoo, which he did. The animal, a calf when caught, had to be weaned on a domestic cow and underwent an epic journey by ship from Mombasa, Kenya, to London, and then on to New York. Even in 1970, a total of only 12 bongos had been exhibited in zoos, and they were always housed singly, never in pairs or larger groups.

Bongos have bred at the National Zoo since 1970. (Milton H. Tierney, Jr.)

The Zoo's First Herd

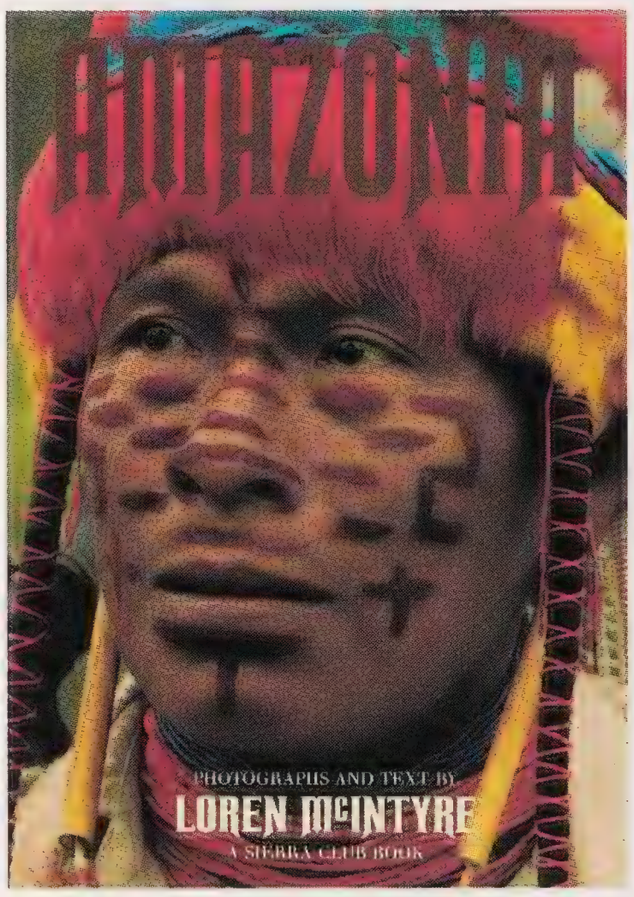
To obtain bongos for the National Zoo, then Director Theodore Reed, sponsored by the National Geographic Society, made several expeditions to Africa. In October 1968, Reed hiked in heavy rains through the bamboo forests of Kenya's Aberdare Mountains at elevations from 7,000 to 10,000 feet. Although he and a National Geographic photographer found bongo trails, which were also used by elephants and Cape buffalo, the reddish antelope with the twisted horns eluded them. Not until several expeditions later were they able to obtain four animals.

On October 26, 1970, the bongos arrived in Washington. The original herd included two males, Thugi and Kigai, from the Aberdare Mountains; a female, Kanitia, also from the Aberdare region; and a second female, L'Ehania, from the Ivory Coast. Their journey to North America, begun in their native forests, included two months' quarantine in Mombasa, 26 days at sea, and a 30-day quarantine in New Jersey before finally ending in Washington, D.C.

Great fanfare heralded their arrival. Television cameras rolled as the animals were uncrated. Much to the surprise of everyone present, Thugi and Kanitia began breeding within a half hour of their arrival. Not only was breeding documented on film for the first time, but the gestation period for the species was determined when Kanitia gave birth to a female calf nine months later. Although Thugi died in the interval between mating and birth, his genes were carried on to another generation.

The arrival of the bongos also set in motion a decade-long study of their behavior that greatly enriched scientific understanding of this species. And, although bongos are still not among the most frequently exhibited animals, about 200 now live in zoos worldwide. The 16-fold increase in the zoo population of bongos since the 1970s suggests that zoo scientists have indeed come to understand the animal's biology. Successful breeding efforts such as the one at the National Zoo ensure that future generations of zoogoers will have the opportunity to see these magnificent forest antelopes. ✤

Margie Gibson is a staff writer in the Zoo's Office of Public Affairs.



Children's Books

The Rain Forest. 1991.
Billy Goodman. Tern Enterprise, Inc., New York.
96 pp. hardbound, $17.95.
How many species of mammals, birds, and insects live in four square miles of rainforest? This informative book introduces young explorers to the amazing diversity of an endangered habitat.

The Rainforest. 1992.
Laura Tangley. Chelsea House Publishers, New York.
135 pp. hardbound, $12.95.
Part of the "Earth at Risk" series, this volume examines the destruction of rainforests, suggests solutions to the problem, and concludes with ways we all can help.

Tropical Rainforests. 1991.
Cornelia F. Mutel and Mary M. Rodgers. Lerner Publications Co., Minneapolis, MN.
64 pp. hardbound, $15.95.
The authors survey life in, and loss of, rainforests around the world. Visually appealing to catch the young reader's eye, it also contains a comprehensive glossary of terms used to discuss the ecology of the rainforest.

Adult Books

Amazon Beaming. 1991
Petru Popescu. Viking Penguin, New York.
445 pp. hardbound, $25.00.
Romanian author Petru Popescu met writer/photographer Loren McIntyre on a trip down the Amazon River and became fascinated with McIntyre's modest account of his successful quest for the river's source. Popescu was further entranced with McIntyre's mention of the almost metaphysical experiences he has had in his nearly half-century of living among the people of this vast area. This book recounts both.

Amazonia. 1991.
Loren McIntyre. Sierra Club Books, San Francisco.
164 pp. hardbound, $40.00.
Premier photojournalist of Amazonia, McIntyre structured this book after the flow of its great river. His vivid pictures and text take us from the river's source in the icy white waters of the Andes to its muddy brown junction with the Atlantic Ocean. Along the way, we explore the peoples, cultures, and natural history of the region.

The Last Rainforests. 1990.
Mark Collins, Editor. Oxford University Press, New York.
200 pp. hardbound, $35.00.
Subtitled "A World Conservation Atlas," this volume maps more than 50 rainforests from the Caribbean to Bangladesh, and explains the complex issues involved when making decisions about their development as an economic resource.

Vanishing Amazon. 1991.
Mirella Ricciardi. Harry N. Abrams, Inc., New York.
240 pp. hardbound, $49.50.
This book records in pictures and text three ancient and threatened Indian cultures of Amazonia. Accompanying chapters by Marcus Colchester provide anthropological and historical background on the tribes, one of whose spokesmen said, "We are all part of the whole, we cannot neglect or destroy our home."

Into the Amazon. 1990.
Augusta Dwyer. Sierra Club Books, San Francisco.
250 pp. softbound, $10.00.
Canadian writer Augusta Dwyer is one of the few journalists to have become close friends with Brazilian rubber tapper Chico Mendez before his murder in 1988. As a result of their friendship, she was able to document his successful organization of fellow workers and Amazon forest- and river-dwellers in their attempts to preserve their threatened environment and way of life from exploitation.

Lessons of the Rainforest.
1990. Suzanne Head and Robert Heinzman, Editors.
Sierra Club Books, San Francisco.
275 pp. softbound, $14.95.
A series of essays by 24 eminent authorities in a variety of fields confronts the decimation of the world's rainforests, examines related issues, and offers possible strategies to slow the destruction of our invaluable natural resources. We are encouraged, as individuals, to join in this fight.

White Waters and Black.
1926. Gordon MacCreagh.
University of Chicago Press, Chicago.
335 pp. softbound, $11.95.
This classic of Amazon travel is a spirited and very truthful report of a two-year expedition, warts and all, of six unfield-tested scientists into the Amazonia of the 1920s. In the foreword, George Schaller says "If I had to recommend only one expedition account, I would select this one."

Neotropical Rainforest Mammals. 1990.
Text by Louise Emmons.
Illustrations by Francois Feer.
University of Chicago Press, Chicago.
281 pp. softbound, $19.95.
This is a *must* book when you go on your Amazon River trip, being a very readable field guide to the mammals you may see in your travels.

Vanishing Paradise. 1990.
Text by Andrew Mitchell.
Photographs by Stephen Dalton and George Bernard.
Overlook Press, Woodstock, NY.
176 pp. hardbound, $35.00.
In a series of striking photographs gathered over a 10-year period, and described by zoologist Andrew Mitchell, Dalton and Bernard show us what can be found in just one hectare of Amazonian rainforest.

—Compiled and written by Jean B. McConville.

The Bad News...

A 2,000-acre coffee cooperative lies in the heart of El Salvador's capital, virtually the only green area in the cement jungle of San Salvador. Because the coffee is grown under towering trees, the farm is an important refuge for wildlife in a country that has lost 95 percent of its original forests. Every evening at sunset, hundreds of bright-green parrots ("pericos") come home to roost in the treetops, an emotional symbol to city residents. But the acreage is threatened by political infighting and impending condominium development. While tensions build and rhetoric flourishes, the "pericos" continue their flights, oblivious to the danger to their home.

...The Good News

Searching for drugs, U.S. Customs officers often find contraband parrots, tranquilized and stuffed into almost anything (even wooden legs!) on their trip north. Of the estimated 100,000 parrots smuggled into the U.S. each year, at least a third die in transit. Even if recovered alive, they often cannot be released because they are too young to have learned to fly, find food, and avoid predators.

To train them, scientists from Mexico and the San Antonio-based Center for the Study of Tropical Birds constructed a large flight cage in a forested area where parrot predators exist. While learning to fly and feed on native seeds and fruits, young birds observe predator avoidance by older parrots. Caretakers stay out of sight as much as possible. Only a handful of birds have been released so far; 60 more are in training. "We're not interested in just throwing birds in the air," says Center Director Jack Clinton-Eitniear, "we're looking out for their long-term survival."

Tropical Conservation Newsbureau

The Area Scene

Although you may not see any animals, a walk in the woods after a snowfall will probably reveal more evidence of wildlife than a hike at any other time of the year. And, you can find out more about an animal from observing its tracks in the snow than you're likely to learn from catching a fleeting glimpse of it through the trees.

In addition to neighborhood cats and dogs, winter wanderers in the Washington metropolitan area include field mice, squirrels, raccoons, red and gray foxes, and white-tailed deer. Two excellent field guides, Olaus J. Murie's *Animal Tracks* (part of the Peterson series) and Donald Stoke's *A Guide to Nature in Winter* (part of the Stokes series), show how tracks can be used to discover everything from denning sites to dietary habits.

Squirrel nests are easiest to observe in the bare trees of winter. Look for lots of activity starting at the end of December, when mating season begins.

In this period, observant hikers may be lucky enough to see great horned owls resting in evergreen cover during the day. Hawks may also be spotted in the branches of deciduous trees.

What's In a Name?

Hippopotamus, derived from the Greek *hippos potamios*—literally, water horse—is a name that aptly describes the habits of this large mammal. With eyes, ears, and nostrils placed on top of its head, a hippo spends most of its day in the water, submerging for up to five minutes at a time. Hippos mate in the water, and babies are born and nurse near or in shallow water, occasionally even underwater. Emerging at night to feed for five or six hours, hippos may graze an area six miles from water, but soon return to the aquatic medium that helps support their great weight.

Car Care

Old automobile tires can be retreaded or recycled into a variety of products from tugboat fenders to rubber paving. Unfortunately, the recycling process is currently more expensive than dumping the tires, and as a result only about 27 percent of waste tires are reused or recycled. Following recommended inflation, balancing, and rotation guidelines, as well as maintaining proper front-end alignment, will greatly extend the life of your tires. And there's another good reason to keep tires properly inflated: Studies show that low tire pressure on cars wastes more than two million gallons of gasoline in the United States every day.

From the Environmental Defense Fund's Recycling World.

Urban Animal Safari

The Washington metropolitan area provides ideal habitat for a variety of wild animal artistic creations. These lively, if inanimate, creatures range all over the region, from our most famous public places to the most secluded private lairs. Pictured here is one of these fantastic animals—do you know where to spot it? (Look for the answer in our January/February 1993 issue.)

Answer to the July/August Urban Animal Safari: Private residence, 3147 19 Street, N.W., Washington, D.C.

(Christy Bowe)

Lucky 13

At the National Zoo's Reptile Discovery Center, 13 may be the luckiest number of all. On September 13, the first Komodo dragon (*Varanus komodoensis*) ever hatched outside its native Indonesia did so at George Mason University in Fairfax, Virginia. The egg was laid 237 days earlier at the National Zoo. Within four weeks, a total of 13 Komodo dragons had hatched at George Mason and the Zoo. The lucky 13 comprise the largest hatching of Komodo dragons on record, in zoos or in the wild.

Baby Komodo dragons emerge from their three-inch-long eggs weighing nearly four ounces and measuring an impressive 16 inches in length, but giving little indication of the behemoths they will become. Komodo dragons are the world's largest lizards: The average adult is five-and-a-half to six feet long, but large individuals can be as long as seven-and-a-half to eight-and-a-half feet. And, although the average weight of an adult dragon is about 20 pounds, some animals can weigh more than 100 pounds. (The largest dragon ever measured was more than ten feet long and purportedly weighed more than 300 pounds.) In general, males tend to become somewhat longer and heavier than females.

Komodo dragons—also known as Komodo monitors or oras—are scavenger-predators, which means they eat carrion when it is available and take live prey when it is not. In the wild, dragons feed on deer, wild boar, smaller Komodo dragons, and even domestic water buffalo.

A hatching Komodo dragon. (Jessie Cohen/NZP Graphics)

And, the Komodo dragon is built for the business of killing and feeding on large prey. Its sharklike teeth are curved and serrated, allowing it to tear off huge chunks of flesh. The dragon's skull is equipped with movable joints and plates—a feature it shares with snakes—which permit it to swallow large and unwieldy portions of prey. Komodo dragons routinely swallow the entire hindquarters of full-grown goats and have been observed swallowing whole fawns and piglets. The dragon's feet have long, sharp claws for seizing and ripping flesh.

Komodo dragons are the top predators throughout their range, occupying the same niche held by big cats elsewhere in Asia. Their range, however, is remarkably small: It consists of three tiny Indonesian islands (Komodo, Padar, and Rinca), and a portion of a larger island (Flores), whose combined area amounts to about one-fourth that of Rhode Island. In fact, these monitors have the smallest range of any large carnivore.

Although scientists estimate that the current Komodo dragon population of about 5,000 has not changed appreciably since the lizard's "discovery" in 1910, its limited distribution combined with the threat of human encroachment has led to the Komodo dragon's classification as a rare and endangered animal.

So, when Indonesia's President Soeharto offered visiting President Ronald Reagan a gift of two Komodo dragons in 1986, the animals' arrival was viewed with much anticipation and excitement at the National Zoo. It took nearly two years of haggling with the U.S. Fish & Wildlife Service, however, before the paperwork was approved and Curator of Herpetology Dale Marcellini and keeper Bela Demeter set off to pick up the lizards at Jakarta's Ragunan Zoo and bring them back to the National Zoo.

After spending a month in routine quarantine, the two Komodo dragons were finally placed on exhibit in their enclosure behind the Reptile Discovery Center on July 13, 1988. At the time, the monitors were the only ones of their kind in the United States. (The Cincinnati and San Diego zoos have since received Komodo dragons.) Although Indonesian officials were fairly sure the animals were a male and a female, it's extremely difficult to determine the sex of a Komodo dragon, and Zoo scientists were able to confirm the dragons' sexes only after observing them mate.

In an effort to encourage breeding, Zoo scientists and staff expanded the size of the

Less than two feet long now, this dragon may grow to as long as eight or nine feet. (Jessie Cohen/NZP Graphics)

Komodo dragon exhibit in 1990, and created a separate nesting area for the female. This was viewed as a necessary first step because, in the wild and in captivity, both male and female Komodo dragons are known to eat their own eggs. The exhibit was provided with an earth floor, in part because evidence suggests that dragons in the wild dig burrows and deposit their eggs inside. In addition, dragons use burrows to escape the extreme heat (temperatures in their native range, as in the exhibit, often reach higher than 100° F) that they at other times prefer for basking.

The events leading up to September's historic hatching began on December 7, 1991, when keeper Trooper Walsh observed courtship activity in the Zoo's dragons. Courtship behavior and matings continued through December 29. The excitement level rose when on January 17, 1992, the female dragon was seen digging a new burrow. Six days later, Zoo scientists found 26 eggs in the burrow, two feet below the surface of the soil.

The female Komodo dragon exhibited no defensive behavior when the Zoo's herpetology staff removed the eggs for incubation. (In the wild, Komodo dragon parents do not watch over their eggs or their hatchlings.) To avoid "putting all the eggs in one basket," Marcellini called on George Mason University zoologist Geoffrey Birchard to incubate 10 of the eggs in his Fairfax lab. The other 16 eggs were incubated at the Zoo.

During the eight-month incubation period, scientists at both institutions routinely inspected and weighed the soft, leathery eggs. As was expected, several of the embryos died within their shells. But, fully half the eggs in the clutch survived, as compared to the 25-percent survival rate estimated for eggs laid in the wild.

For keepers Roger Rosscoe and Trooper Walsh, the hatching of the first Komodo dragon on September 13 meant a complete change in lifestyle. For the next 41 days (when the last dragon hatched but did not survive), the two maintained a 24-hour vigil, taking turns sleeping on a couch upstairs at the Reptile Discovery Center at night, waking to an alarm every four to six hours, and descending to the basement to check on the incubating eggs. Rosscoe and Walsh looked for signs of hatching and in some cases assisted the animals by cutting slits in the eggshells.

Zoo visitors can see one of the baby dragons at the Reptile Discovery Center. The young dragons are brighter in color than their parents and are heavily patterned with chevrons and circular markings. This undoubtedly helps them blend into the arboreal habitat where they spend the early part of their lives, hunting for smaller lizards and insects and avoiding larger dragons.

At the moment, all 13 baby dragons are being kept in separate enclosures at the Reptile Discovery Center. Throughout their lives, the greatest predation pressure on Komodo dragons comes from within the species, and, although it is not known at what age the lizards might begin to prey on each other, as Walsh says, "We don't want to find out the hard way."

Some of the young will almost certainly be sent to other zoos. But, transfer will depend as much on the readiness of the receiving institutions as on the development of the young dragons. Walsh points out that housing and care of Komodo dragons is an expensive proposition, and commitment to individual animals and the species will be a major criterion in selecting among the many institutions interested in exhibiting the monitors.

The National Zoo has already sent its adult female Komodo dragon to the Cincinnati Zoo on a one-year breeding loan in hopes of increasing the diversity of the species' North American gene pool. Everyone involved with the breeding program at the National Zoo is eager to share the knowledge gained from their experience with the "lucky 13" to help ensure the survival of these awe-inspiring creatures.

—Ward Merritt

Shanthi Returns

She left the National Zoo on March 13, 1991, an elephant with a mission. Shanti had been recommended to participate in the North American breeding program of the Asian elephant Species Survival Plan (SSP). Now, Shanthi has returned to the Zoo with the first part of her mission accomplished: After spending 20 months with a breeding bull elephant at the Burnet Park Zoo in Syracuse, New York, she is nine-months pregnant.

Shanthi was chosen from among the National Zoo's three female Asian elephants to participate in the breeding program because at 16 years old she has entered her prime breeding years. And, according to Collection Manager John Lehnhardt, Shanthi is an exceptionally adaptable and social animal whose easygoing disposition made her an ideal candidate for the program.

Selecting a mate for Shanthi was no simple task. Only 14 male Asian elephants that are proven breeders live in North American zoos. The Burnet Park Zoo was ultimately chosen as the receiving institution for several reasons. First, its male is a proven breeder. Second, Lehnhardt says that Burnet Park and the National Zoo share similar views on exhibiting and breeding this endangered species. And, last but certainly not least, the Syracuse park is the closest one with a breeding male.

Scientists began to suspect that Shanthi was pregnant last June after careful analysis of changes in her serum progesterone levels in weekly blood samples. She did not return to the National Zoo until November 12—nine months after the estimated date of conception—because scientists at both institutions thought it best to wait until after the first trimester before transporting her (gestation in Asian and African elephants is 20 to 22 months).

Shanthi's return trip to the Zoo was exquisitely timed: Lehnhardt waited for a sunny day to leave Snow-Belt Syracuse, departing from Burnet Park in the early morning to avoid the rush-hour lane restrictions and accompanying traffic jams on southbound Connecticut Avenue.

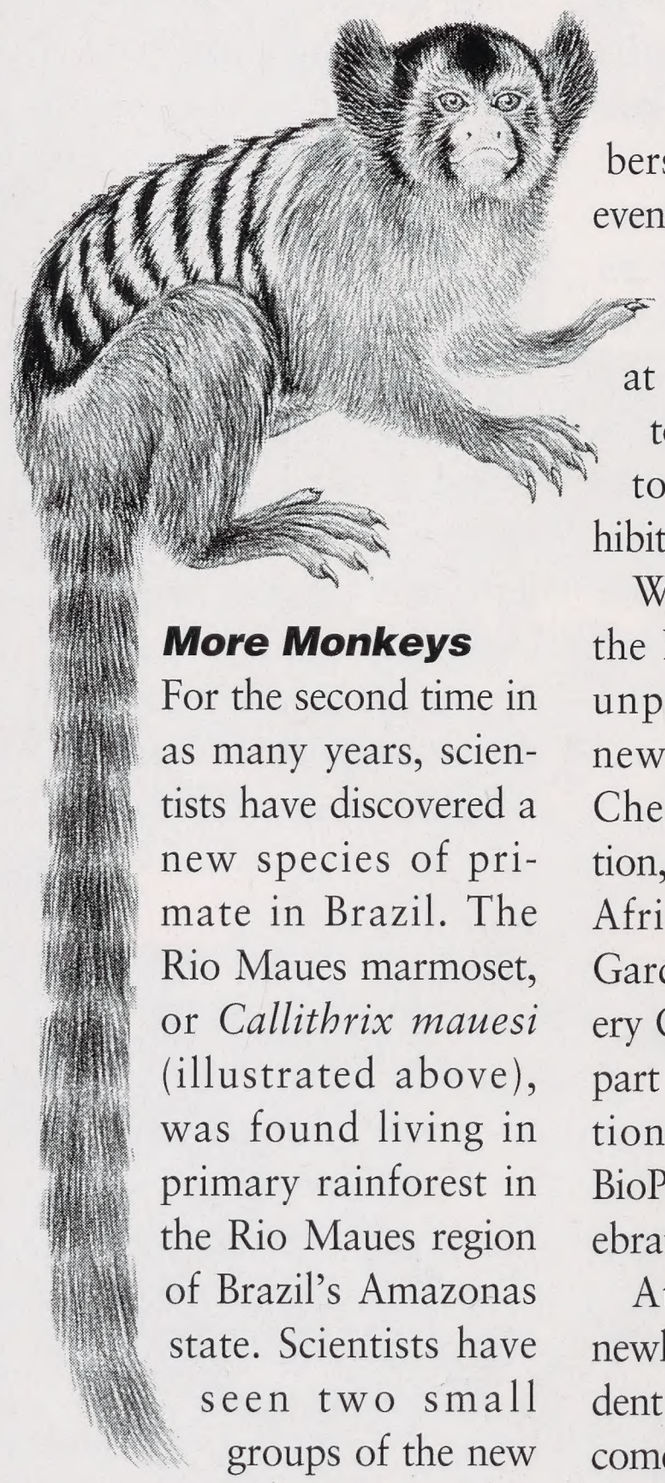
Within an hour and a half of her arrival, Shanthi was back in the enclosure with the other elephants. Lehnhardt says that her return may shake up the herd's dominance hierarchy a bit, but he doesn't foresee any real difficulties.

If all goes well, Shanthi will probably give birth sometime between Halloween and Christmas, 1993. But, Lehnhardt cautions against overoptimism, pointing out that first pregnancies are difficult in large mammals such as elephants. The mortality rate among first calves is 30 percent for zoo populations and 50 percent among wild elephants. Shanthi's calf would be the first Asian elephant born at the National Zoo.

The pregnant Shanthi has returned to the Zoo.
(Jessie Cohen/NZP Graphics)

ZooFari 1993

Plan now to join us at "Orang Shebang"—the tenth annual National ZooFari set for May 20, 1993. Acclaimed by the media as "the best fundraiser in the region," ZooFari features fabulous food from nearly 100 area restaurants, including such culinary stars as Jean Louis, Galileo, and Red Sage; great entertainment; and a wildly good time. Best of all, ZooFari benefits a great cause: exhibition and conservation programs at the National Zoo. For instance, in 1992, FONZ has contributed $70,000 for graphics, landscaping, and other items for the Cheetah Conservation Station; $48,000 for the Reptile Discovery Center; about $35,000 for *Amazonia*; and $4,300 for the incubator in which the Zoo's Komodo dragon eggs hatched. This year's gala netted more than $160,000, a number we hope to increase in 1993. Ticket prices will go up in 1993, to $85 for FONZ members and $100 for nonmembers; table prices will also increase to $1,400 for tables of ten and $1,800 for tables of ten hosted by a National Zoo zoologist. But, if you purchase your tickets or table before February 1, you will pay 1992's prices: $75 for members, $90 for nonmembers, and $1,250 or $1,500 for tables. In addition, in 1993, only a limited number of Zoologist Tables will be available on a first come, first served basis, so call 202.673.4961 to place your order today.



Stephen Nash

More Monkeys

For the second time in as many years, scientists have discovered a new species of primate in Brazil. The Rio Maues marmoset, or *Callithrix mauesi* (illustrated above), was found living in primary rainforest in the Rio Maues region of Brazil's Amazonas state. Scientists have seen two small groups of the new species, which differs from other marmosets in its darker coat color and distinctively shaped ear tufts.

Here at the Zoo, two pygmy marmosets (*Callithrix pygmea*) were born on October 28 in the Great Ape House. The smallest of all monkeys, adult pygmy marmosets weigh from four to seven ounces and average only seven inches in length. Pygmy marmosets are widely distributed in Amazonian Colombia, Peru, Ecuador, and Bolivia.

FONZ Welcomes New Board Members

One thousand FONZ members visited the Zoo on the evening of Friday, October 16, to greet new members of the Board of Directors at the Annual Meeting and to take a special nighttime tour highlighting new exhibits at the park.

With support from FONZ, the National Zoo added an unprecedented number of new exhibits in 1992. The Cheetah Conservation Station, the American Indian and African-American Heritage Gardens, the Reptile Discovery Center, and *Amazonia* are part of the Zoo's transformation into the nation's first BioPark, a living museum celebrating life in all its diversity.

At the business meeting, newly reinstalled FONZ President Richard D. Buckner welcomed three new members to the Board of Directors: Francisca B. Holland, principal of the District's Oyster Bilingual Elementary School and a career educator specializing in bilingual education; Colbert I. King, a member of the Editorial Board of the *Washington Post*, and the former United States Executive Director of the World Bank; and David Perry, Deputy Director of the Federal City Council, a nonprofit organization that works for the betterment of the Nation's Capital.

In addition, William H. Berman, Miriam V. Carmack, and Anne Shultz were elected to their second three-year terms on the FONZ Board.

Finally, FONZ members saluted retiring Board members Josephine T. Burman, George A. Didden, III, and Kenneth R. Sparks for the thousands of hours they contributed to FONZ and the Zoo.

Crane Chick

On September 15, sharp-eyed Zoo visitors had a chance to watch the hatching of an African crowned crane chick (*Balearica regulorum*). The female crowned crane laid three eggs on a bare spot on the ground in mid-August. One egg disappeared about halfway through the 30-day incubation period. A chick began to hatch from the second egg on September 14, but died in the process. The surviving chick seems to be thriving. At two months of age, it is nearly as big as its parents and already sports a feathery "crown," although it will be about two years old before it shows the same coloration as the adults, and seven or more years of age before it is ready to breed. You can see the chick at the Cheetah Conservation Station, where it and its parents share an enclosure with the dama gazelles.

Letter

In "The Taxonomic Twist" (July/August 1992), the idea that red wolves are timber wolf-coyote hybrids is presented as fact. Actually, this conclusion is highly controversial, based on a single study, the results of which even the study's authors agree, are open to other interpretations. Other scientists have also criticized the study and support the recognition of the red wolf as a valid species or subspecies. My own research indicates that red wolves lived in the southern U.S. before timber wolves evolved, and still existed in good numbers until the early 20th century. Later, as coyotes expanded their range, hybridization between red wolves and coyotes did become common. Indeed, this was one reason the red wolves were classified as endangered—coyotes were essentially swamping the red wolf gene pool. However, red wolves from a wild population largely unaffected by such genetic swamping were captured in the 1970s for a breeding program; the descendants of these animals are now being reintroduced into parts of their former range. Unfortunately, the publicity surrounding the claim that red wolves are hybrids threatens the continuation of this highly successful reintroduction effort. The U.S. Fish & Wildlife Service has rejected legal claims that the red wolf is a hybrid that should be taken off the endangered species list and is continuing with its conservation efforts.

—Ronald M. Nowak
U.S. Fish & Wildlife Service

Steve Torna is a dentist with the Indian Health Service. While employed at the Blackfeet Community Hospital in Browning, Montana, Torna was a frequent hiker in nearby Glacier National Park. Last spring, as he does every year when the snow thaws, Torna visited the "goat lick," a natural salt lick within park boundaries that is frequented by mountain goats.

Arriving at the goat lick, Torna began setting up to photograph the 20 or 30 mountain goats that had gathered there. Suddenly, the whole group began to scatter in great alarm. At first, Torna thought that perhaps he had spooked the animals, but then he saw a mountain goat struggling under the weight of an attacking puma. The two animals tumbled down the hill, within 10 feet of Torna, into a ravine.

According to Torna, the puma maintained a firm grip on the goat's neck for 10 minutes, during which time the latter put up no struggle. After killing the goat, the puma noticed Torna some 25 feet above and began to advance toward him. Torna followed his first instinct, which was to run, and when he finally looked back, the puma was nowhere to be seen.

Understandably nervous after this episode, Torna began to leave the scene. However, glancing back he once more caught sight of the puma, on the other side of the ravine, stalking two mountain goats. He returned and set up his equipment.

The accompanying photos document the puma's second attack. The force of the cat's initial charge carried both animals down a steep rock face. Once again at the bottom of the ravine, the puma gripped the goat's neck, and, exactly as it had done previously, dispatched the animal without a struggle. Torna's photos were taken approximately 25 feet above the action. And, when the cat looked up and saw him a second time, Torna snapped one last picture and left without further ado.

Returning to the ravine several days later, the only evidence Torna could find was a bit of goat fur.

—Ward Merritt

Puma attacking mountain goat, Glacier National Park.

Momentum from puma's charge pushes both animals down a steep rock face.

Puma crouches over mountain goat carcass, with fur in its mouth.

Puma spots photographer, who snaps this final shot and promptly leaves the scene.

Stephen P. Torna

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